

# **Kalamazoo River Environment: Stage I Assessment Reports**

**Public Meeting**

**March 15, 2005**

**Plainwell, Michigan**

# Topics

- n What is NRDA and why here?
- n Kalamazoo NRDA progress
- n Stage I Injury Assessment
- n Stage I Economic Assessment
- n River restoration vision
- n How does this fit with Superfund cleanup?
- n Where do we go from here?



# Natural Resource Damage Assessment (NRDA)

- n Process by which trustees make the public whole for injuries to our natural resources caused by hazardous substances
- n The public (and the environment) are made whole through restoration of resources and services
- n Compensatory – past, present, future
- n Authorized under federal and Michigan law

# Why do an NRDA for the Kalamazoo River Environment?

- n The river environment is contaminated with PCBs, and has been for many years

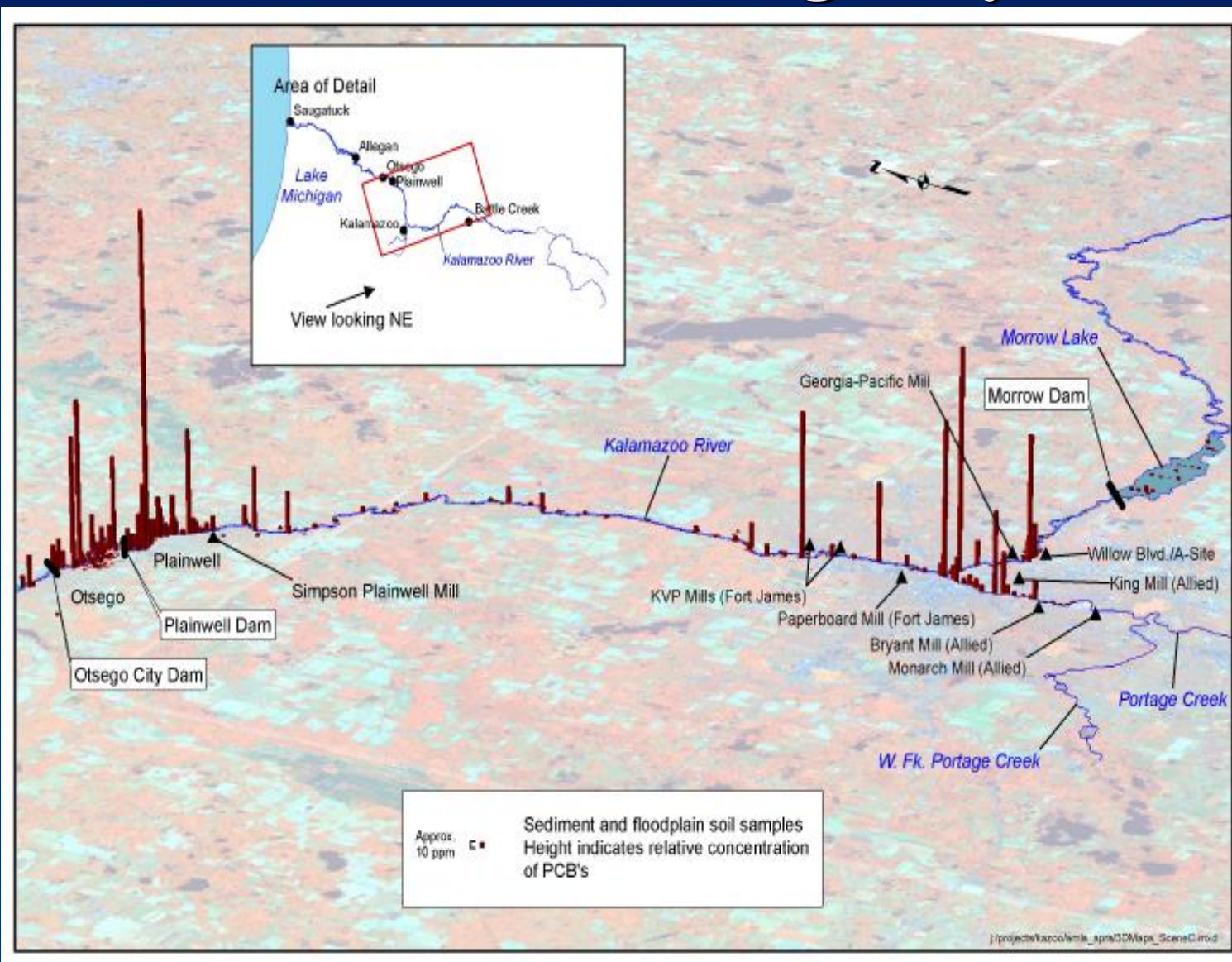
## Kalamazoo River Environment (KRE):

- Areas currently included in all RI/FS work for the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
- Any area where PCBs released from the site have come to be located
- Any area where natural resources and the services they provide may have been affected

# PCBs in the Kalamazoo River Environment

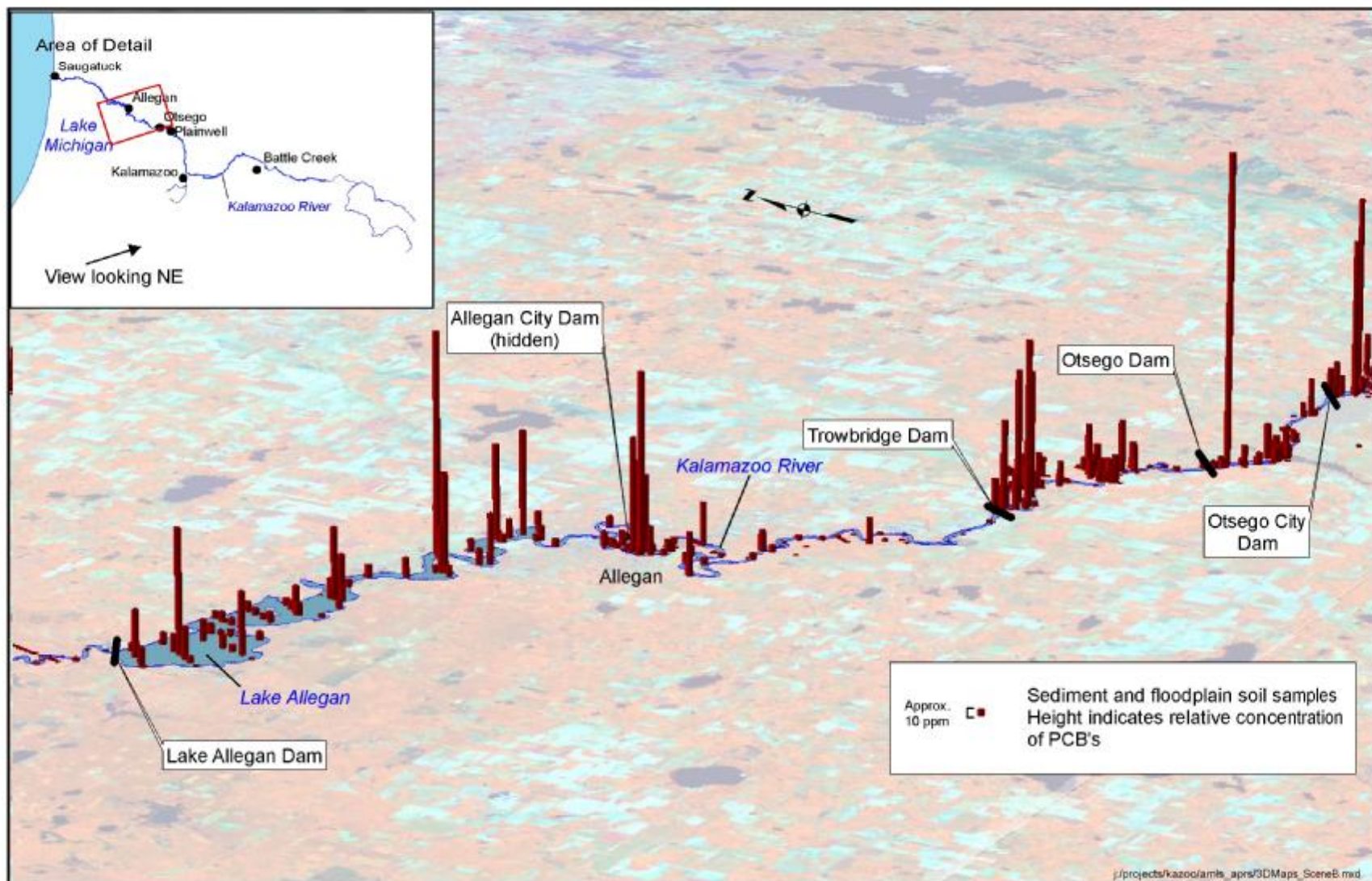
- n Carbonless copy paper was 3.4% PCBs by weight (1954-1971)
- n Released from paper companies (PRPs)
  - n Portage Creek and Kalamazoo River
  - n Releases to river and floodplain
- n PCB pathways
  - n Bound to sediments and soils
  - n Dissolved and bound to particulates in water
  - n ~37 kg / year into Lake Michigan
  - n Volatilize from river and floodplain

# PCBs in surface sediments and soils from Morrow Lake to the Otsego City Dam

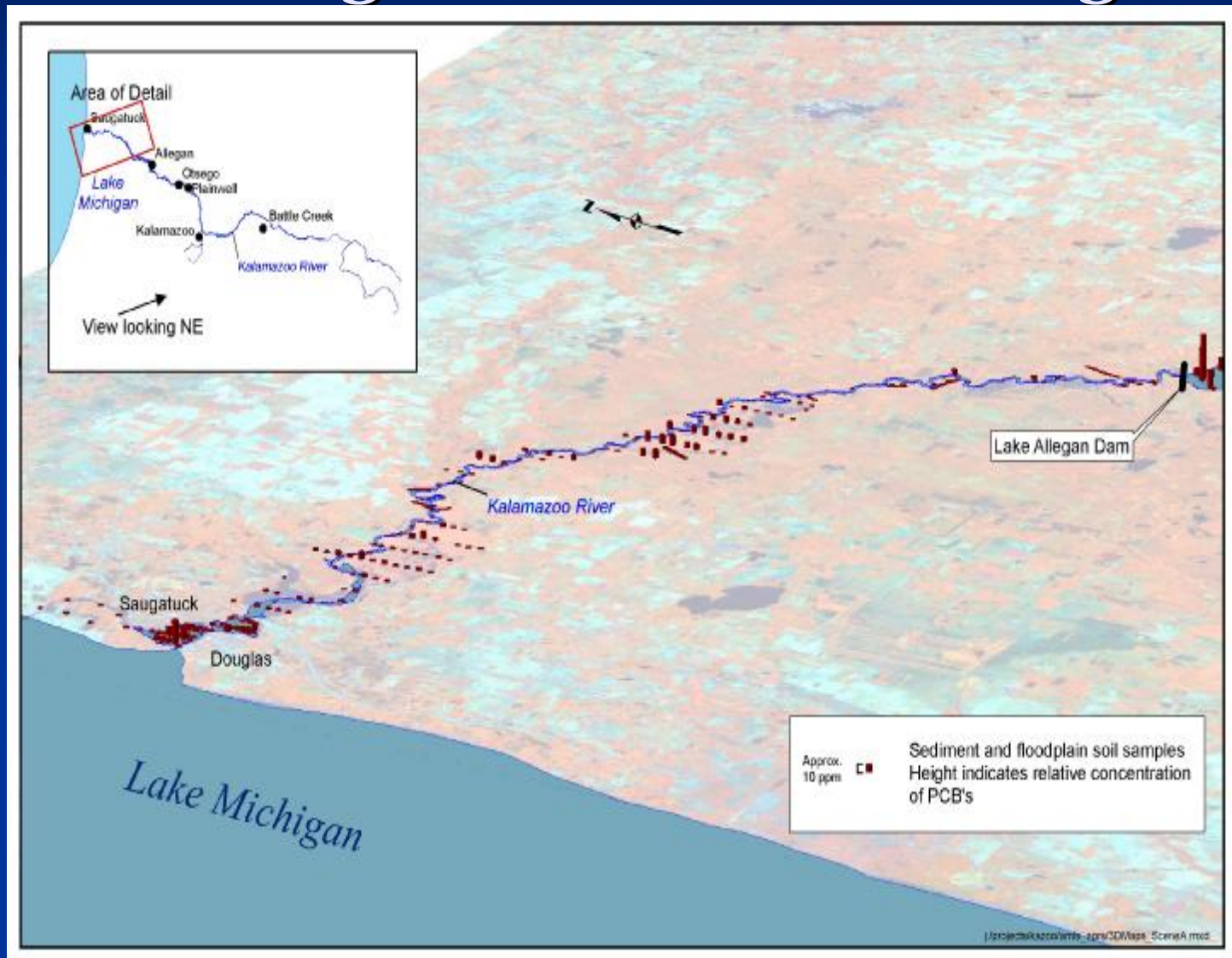




# PCBs in surface sediments and soils from the Otsego City Dam to the Lake Allegan Dam



# PCBs in surface sediments and soils from the Lake Allegan Dam to Lake Michigan

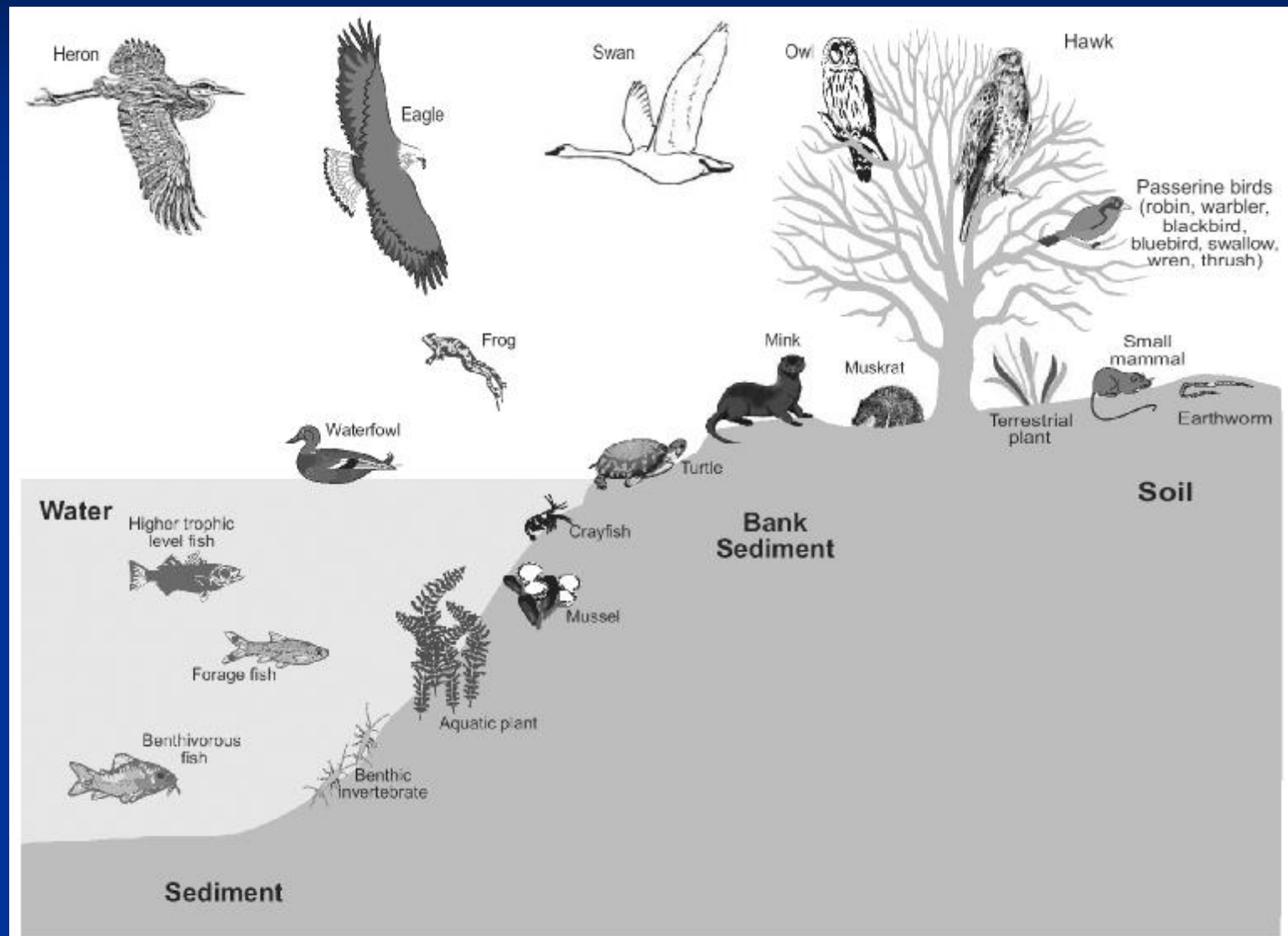




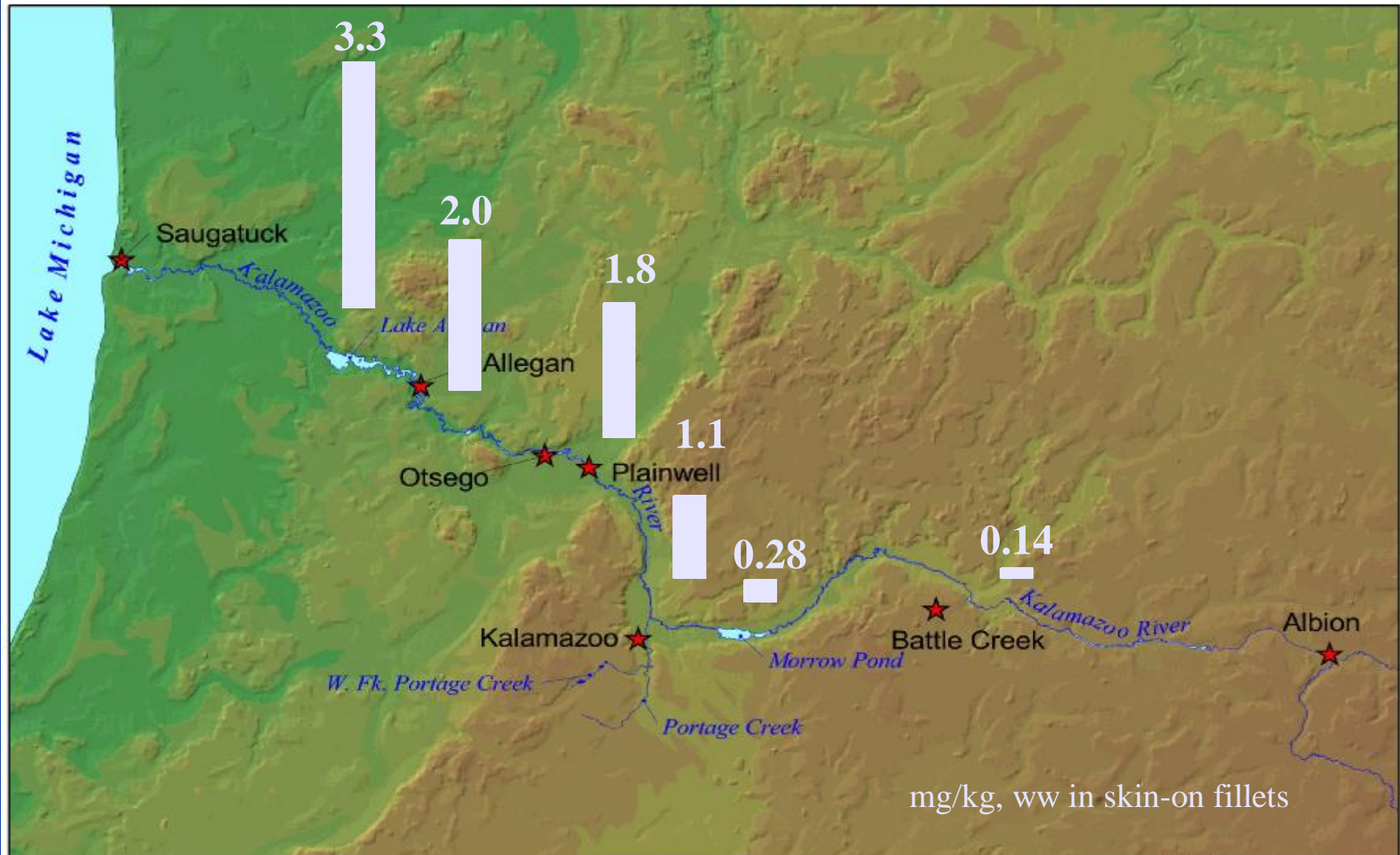
# Why do an NRDA for the Kalamazoo River Environment?

- n The river environment is contaminated with PCBs, and has been for many years
- n PCBs bioaccumulate and are toxic to fish, birds, mammals and invertebrates

# Bioaccumulation



# PCBs in Smallmouth Bass



# Problems Caused by PCBs

- n Fish Consumption Advisories
- n Adverse effects on vertebrates:
  - n Reproductive impairment, embryo mortality
  - n Tissue lesions: liver, jaw, heart, blood vessels
  - n Behavioral impairments
  - n Physiological, biochemical, and immune dysfunction
- n Restrictions on dredging and dam removal
- n Violations of water quality standards



# Why do an NRDA for the Kalamazoo River Environment?

- n The river environment is contaminated with PCBs, and has been for many years.
- n PCBs bioaccumulate and are toxic to fish, birds, mammals and invertebrates.
- n The remedy will not solve all PCB problems immediately and cannot compensate for “interim losses.”
- n The upcoming Superfund remedy itself may impact natural resources.

# NRDA leads to Restoration

- n Restoration will focus on the river as a functioning ecosystem and its benefits to people.
  - n Together with the Superfund remedy and community efforts, it can improve the river environment as a whole.
  - n Improving the river's natural resources can both restore to baseline conditions and compensate for interim losses.

# Kalamazoo NRDA Organization

## n Trustees:

- n Michigan Dept of Environmental Quality

- n Michigan Attorney General

- n U.S. Fish and Wildlife Service

- n National Oceanic and Atmospheric Administration

- n Michigan Dept of Natural Resources (Fall 2004)

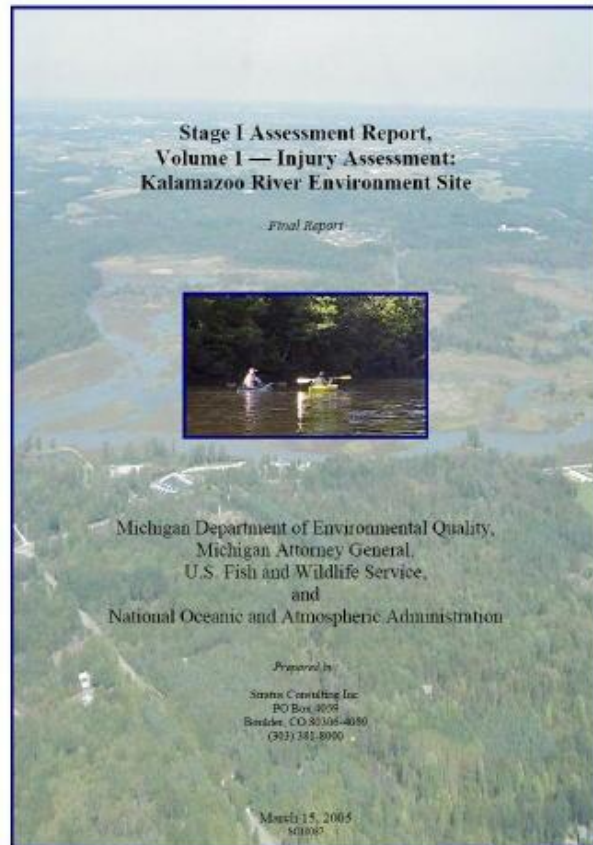
## n MOU for trustee coordination

# Kalamazoo NRDA History

- n Preassessment Screen in 2000
  - n Release, pathway, injury, damages, liability
  - n Michigan, USFWS, NOAA proceeding with NRDA
- n Assessment Plan in 2000 for Stage I
  - n Based primarily on existing data
  - n To demonstrate injuries and damages
    - n in past
    - n in future, based on remedies to be proposed in expected RI/FS
  - n Does not address all possible injuries and losses



# Stage I Reports



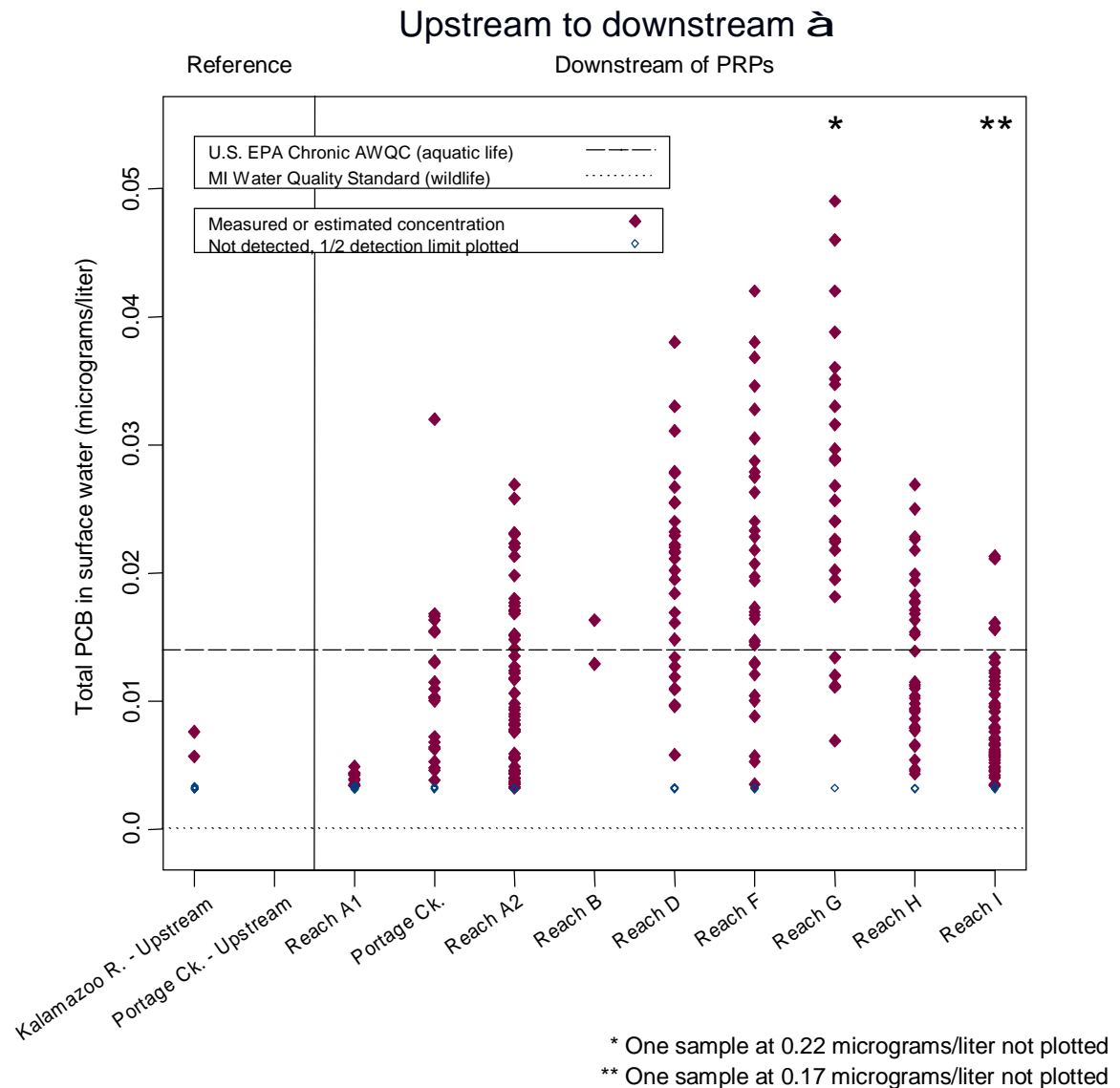
- n Covers entire river, past, present and future
- n Focuses on impacts for which we have existing data
- n Injury Report
  - n Documents injuries caused by PCBs
  - n Compares to baseline and criteria
- n Economics Report
  - n Documents public values and recreational fishing losses
  - n Provides restoration examples and guidelines

# Injury Assessment Chapters

- n Introduction
- n PCB Releases and Pathways
- n Injuries to Surface Water
- n Injuries to Sediment
- n Injuries to Resource Services: Fish Advisories
- n Injuries to Fish and Aquatic Invertebrates
- n Injuries to Wildlife
- n Indirect Injuries
- n Conclusions

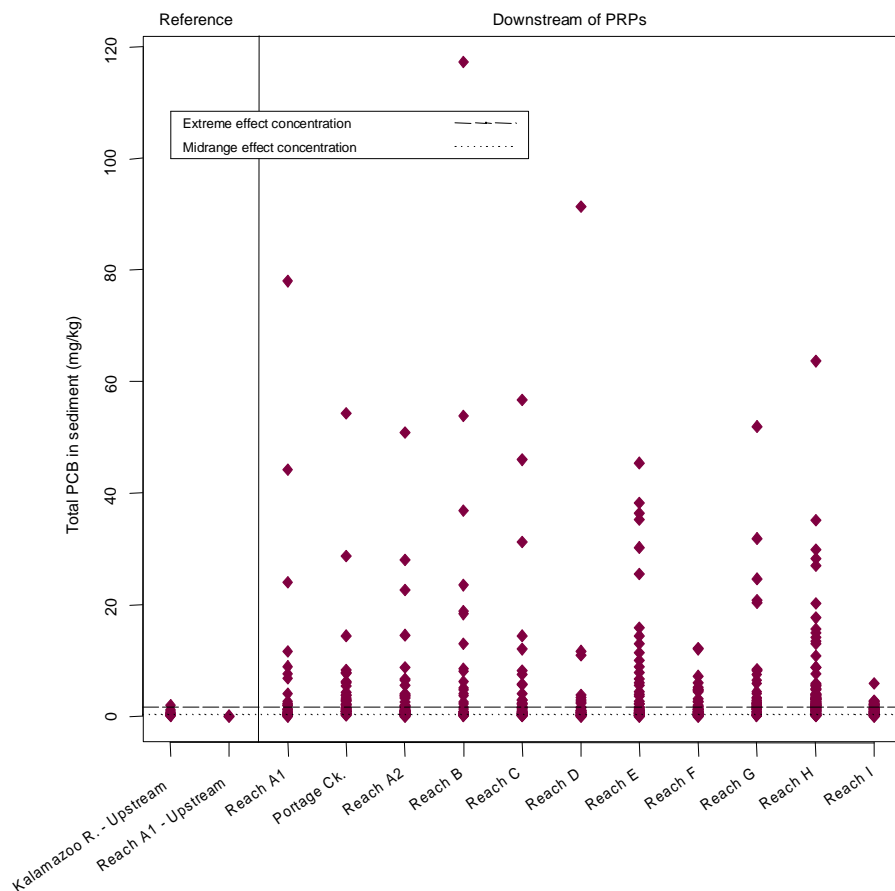
# Injuries to Surface Water

- n Drinking water standards for PCBs (0.5 µg/L) not exceeded in the river.
- n Water quality standards exceeded for wildlife, human cancer risk, and aquatic life (data from 1985-2001)
- n Surface water has been and is injured.

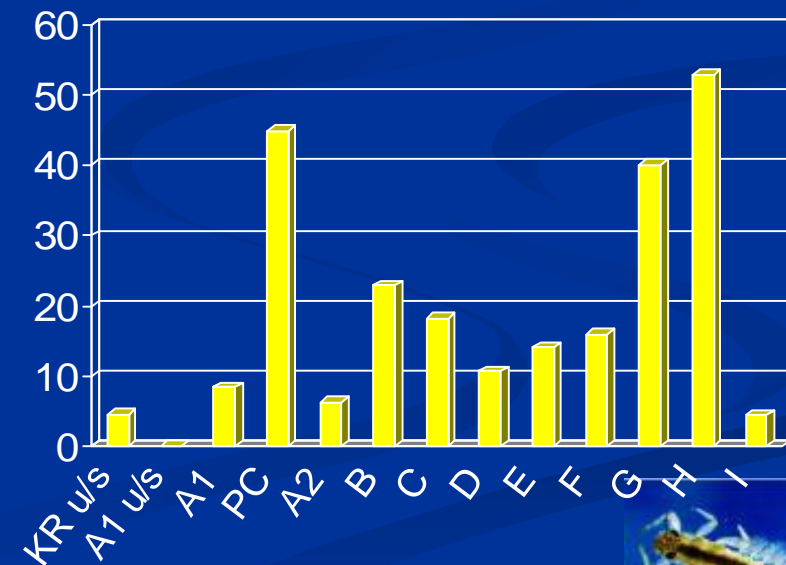


# Injuries to Sediment - Benthos

- PCB concentrations in surface sediment are most likely sufficient to cause injury to benthic invertebrates based on exceedences of consensus-based effects concentrations.



Percent of surface sediment samples greater than Extreme Effects Concentration



River Reach (u/s --> d/s)

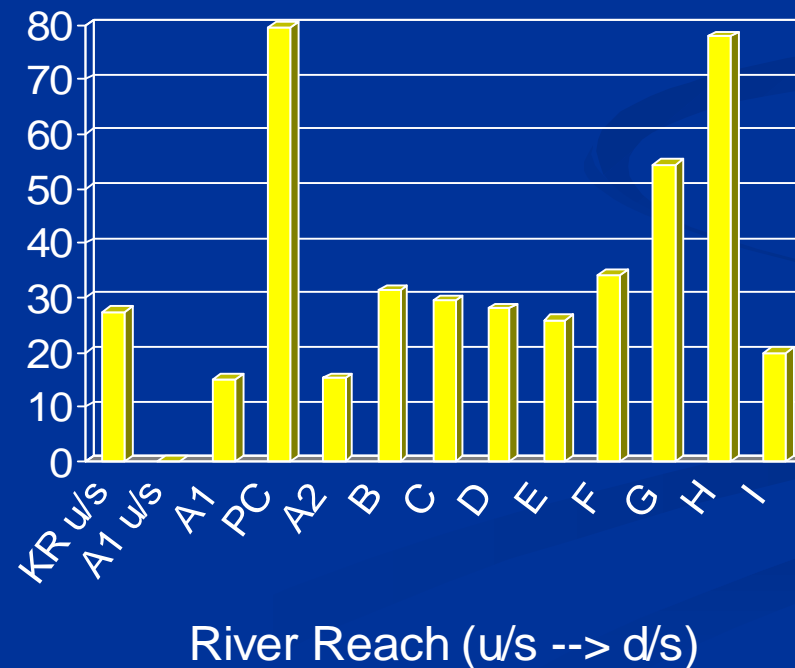




# Injuries to Sediment - Mink

- n MDEQ's Baseline Ecological Risk Assessment
  - n No effect on mink: 0.5 mg PCB/kg dw sediment
  - n Low effect on mink: 0.6 mg PCB/kg dw sediment

Percent of surface sediment samples greater than Low Effects Concentration

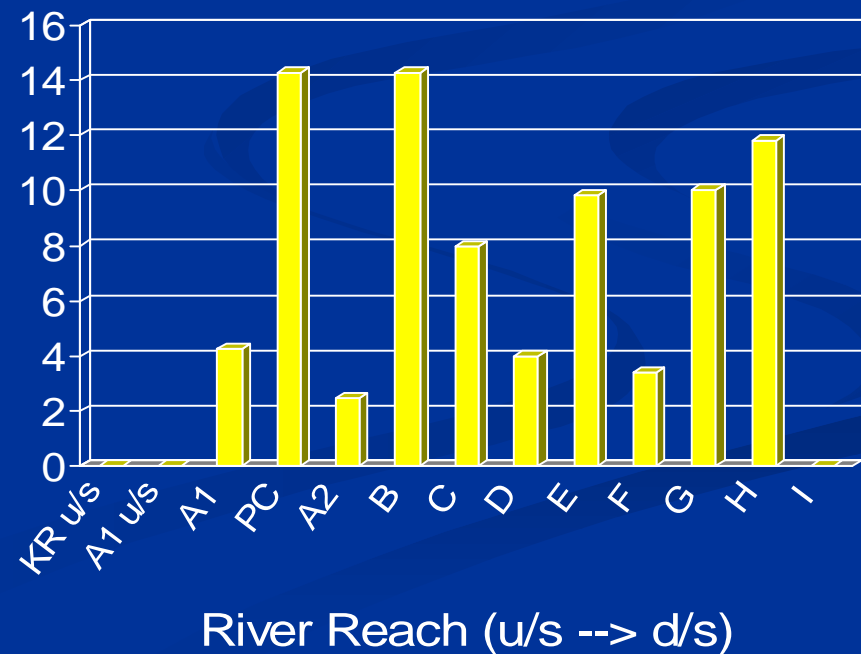
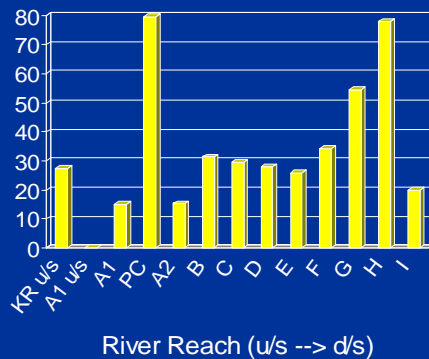


# Injuries to Sediment - Mink

- n MDEQ's Baseline Ecological Risk Assessment
  - n No effect on mink: 0.5 mg PCB/kg dw sediment
  - n Low effect on mink: 0.6 mg PCB/kg dw sediment

Percent of surface sediment samples greater than 10x Low Effects Concentration

Percent of surface sediment samples greater than Low Effects Concentration

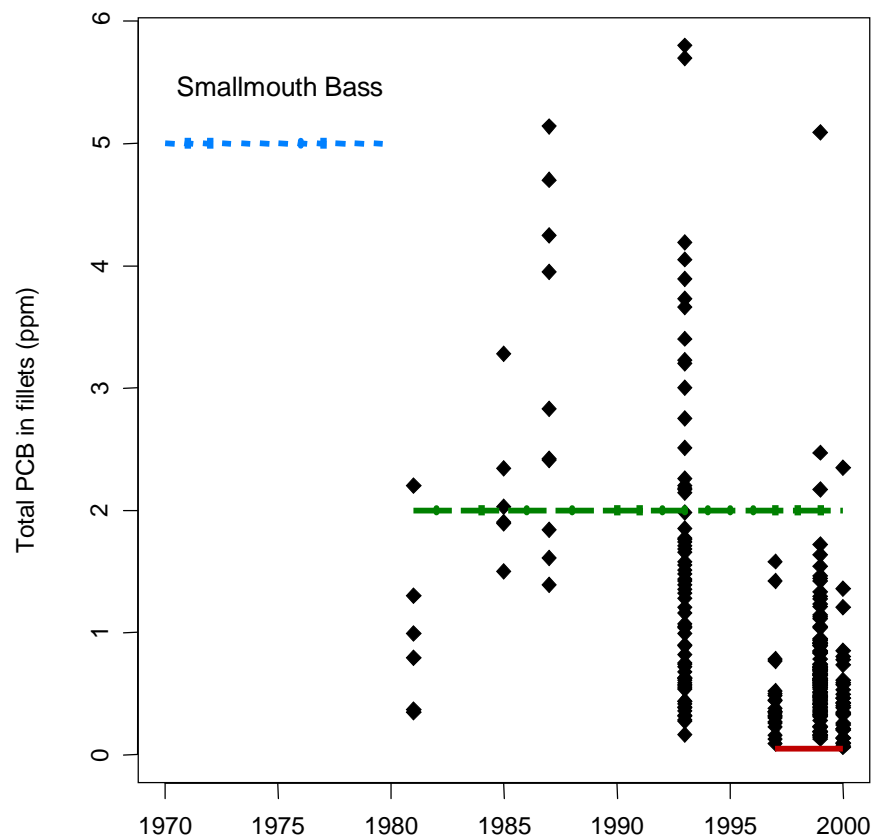


# Injuries to Services: Advisories

- n Fish are injured when PCBs result in consumption advisories (FCAs)
- n Multiple species since 1979
- n Levels:
  - n No consumption (e.g. carp, pike, all species for women and children)
  - n Limit to 1 meal/month
  - n Limit to 1 meal/week
- n Lake Michigan FCAs also apply up to Lake Allegan Dam
- n Services provided by fish have been and are injured.



# Total PCBs in Smallmouth Bass Fillets from Morrow Dam to Lake Allegan Dam



Michigan Trigger Level (5 ppm)

Michigan Trigger Level (2 ppm)

Michigan Trigger Level –  
Sensitive Populations (0.05 ppm)



# Injuries to Fish

- n Known effects of PCBs on fish in the laboratory
  - n Egg and fry mortality
  - n Liver tumor formation
  - n Reduced resistance to disease
  - n Deformities
  - n Hormonal changes (estrogens, thyroid)
  - n Increase in oxidative enzymes



# Findings for Kalamazoo Fish

- n Concentrations of PCBs and related compounds in smallmouth bass (SMB) and walleye eggs from KRE:
  - n less than most effect levels in the literature
  - n available effect levels are from other species
- n PCB concentrations in SMB and walleye livers:
  - n Similar to Green Bay walleye that had liver tumors and alterations
- n SMB health indices altered downstream of Kalamazoo
  - n Several changes consistent with PCB exposure
  - n Fewer parasites than in organs of upstream fish
- n SMB may be and may have been injured – uncertainty remains

# Injuries to Wildlife:

## Birds

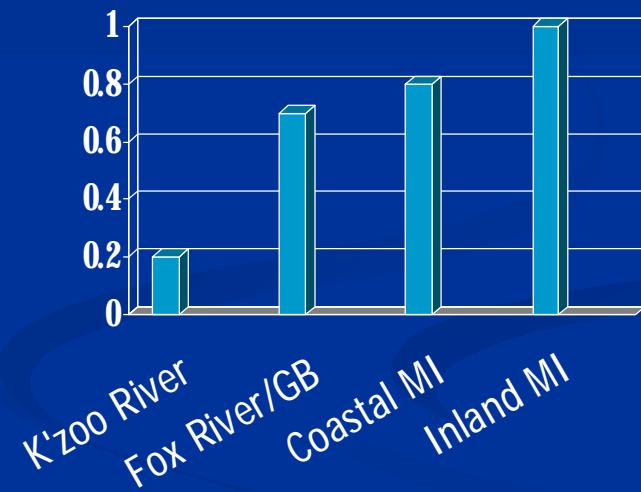
- n PCB concentrations in some fish throughout KRE:
  - n exceed those known to cause embryo death in sensitive bird species
  - n exceed those known to cause sublethal effects in both sensitive and more tolerant species
- n PCBs in bird eggs:
  - n small sample sizes
  - n most exceed threshold for embryo death in sensitive species
  - n 4 of 12 species sampled exceeded threshold for more tolerant species

# Injuries to Wildlife: Birds – Bald Eagles

Bald eagle productivity in the  
Kalamazoo River area

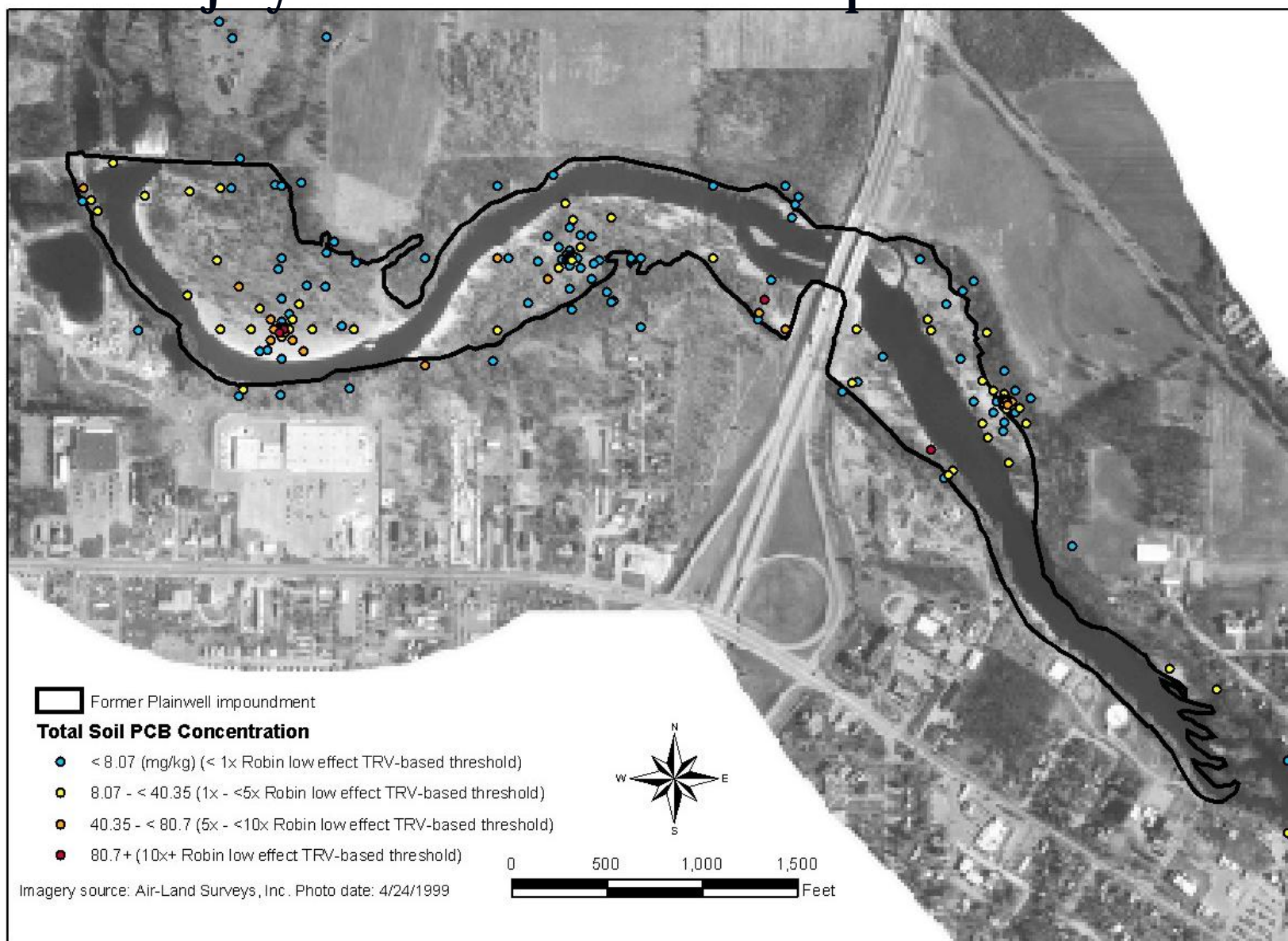
Year	Nests attempted	Young reared
1990	1	0
1991	1	0
1992	1	0
1993	2	0
1994	2	0
1995	2	0
1996	2	0
1997	2	0
1998	2	2
1999	2	2
2000	2	1
2001	2	0
2002	3	0
2003	3	1

Young per occupied nest



PCBs in egg and nestling plasma samples  
exceed injury thresholds.

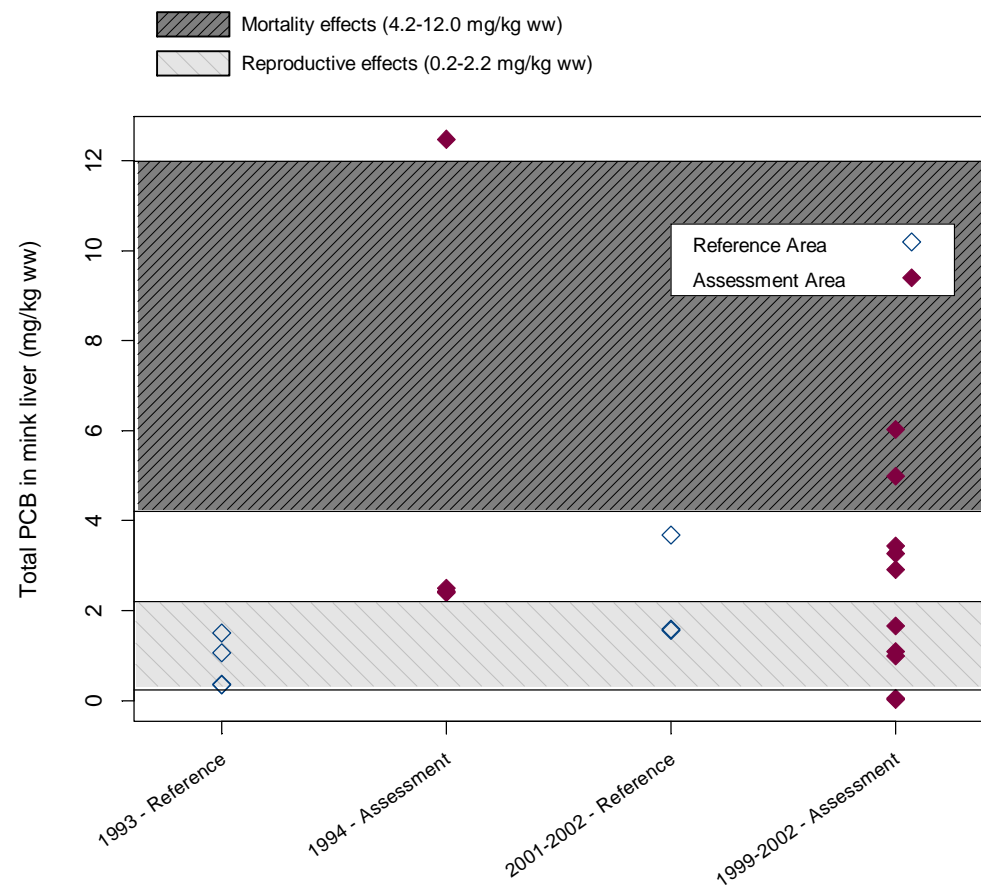
# Surface soil concentrations compared to threshold for injury to robins: Plainwell Impoundment



# Injuries to Wildlife: Mammals

- n Mink are most sensitive species and likely injured.
- n Data do not indicate injury to small mammals.
- n Muskrats – uncertain.

Concentrations in mink livers compared to injury ranges





# Indirect Injuries

- n Response actions can cause injuries to natural resources
- n What would the KRE be like but for the release of PCBs?
  - n e.g. State-owned dams would have been removed
- n Trustees are working with response agencies and PRPs to minimize indirect injuries in the future.
  - n e.g. Bryant Mill Pond removal → dynamic stream

# Potential Impacts of Remedial Options

No further action	Future injuries from PCBs Aging dams with PCBs in sediments behind them
Access / deed restrictions	Decreases in human services Future injuries from PCBs
Bank “stabilization”	Depending on design, <ul style="list-style-type: none"><li>- River channelization</li><li>- In-stream habitat loss</li><li>- Riparian habitat loss</li></ul>

# Potential Impacts of Remedial Options

Maintaining dam structures	Prevention of river processes Prevention of fish movement Impacts to fish and mussel communities Impacts to boating use
Sediment and soil removal	Impacts to fish and benthic communities (short-term) Impacts to habitat (short-term)

# Summary of Injury Report

Surface Water	water sediments, banks	exceed criteria lost habitat functions
Geologic Resources	floodplain soils	lost habitat functions
Biota	benthic inverts, fish, bald eagles, mink, others	biological impairments, advisories
Habitat-indirect	impounded areas remedial actions	dams remain not selected yet

# Economics Report - Restoration

- n Restoration to baseline
  - n Cleanup not yet complete, so restoration not determined
  - n Potential restoration projects compiled
  - n Screening criteria proposed
  - n Survey, focus groups show public preference

# Restoration Ideas

## n Habitat enhancements

- n Remove dams, restrictive culverts, fish passage
- n Remove paper waste to restore floodplain
- n “Soften” shorelines

## n Land Acquisition

- n Preserve river corridor
- n Connect larger parcels, e.g. Allegan State Game area to Gun Lake area

## n Species enhancements

- n Re-establish natives and control exotics
- n Endangered species projects

## n Nonpoint source pollution control

## n Public access and education



# Restoration Project Criteria

- n Based on requirements in NRDA regulations
- n First screen for acceptability
  - n Feasible, addresses injured resources, legal
- n Then evaluate based on criteria
  - n Focus – how well will it meet goals of NRDA
  - n Implementation – how feasible, cost-effective
  - n Benefits – what types, when, for how long

# Economics Report – Making the Public Whole

- n Recreational fishing damages monetized
- n Other service losses not quantified in Stage I
- n Survey, focus groups show public preference
  - n Eliminate or reduce PCB injuries, when feasible
  - n Address other stressors for resources injured by PCBs
- n All funds to be used for restoration

# Recreational Fishing Analysis

- n Calculated both lost quantity and quality of fishing days (not entire economic impact of recreational fishing)
- n Measured actual fishing use
  - n 1985-1987 MNDR
  - n 2001 Trustee surveys
- n Estimated lost use because of advisories
  - n Studies at other sites
  - n Surveys of KRE, Michigan anglers, public
  - n Site-specific adjustments
  - n Recreational fishing demand model (MSU)
- n Estimated reduced quality of fishing because of advisories
  - n Studies at other sites
  - n Surveys of KRE, Michigan anglers, public

# Recreational Fishing Analysis: Results

- n Estimates of fishing days in affected areas
  - n Kalamazoo River: 27,000 – 60,000 angler days / year (varies over time)
  - n Nearby Lake Michigan: 22,000 angler days/ year
- n Past damages
  - n \$9M - \$20M through 2002
- n Future damages
  - n No significant cleanup: \$8M – \$11M
  - n Intensive cleanup: \$4M - \$5M

# Trustee Vision for KRE

- n Free-flowing, dynamic river with fish that are safe to be eaten by people, mink, and bald eagles and with habitat that supports diverse, native species for the continuing benefit of the public.

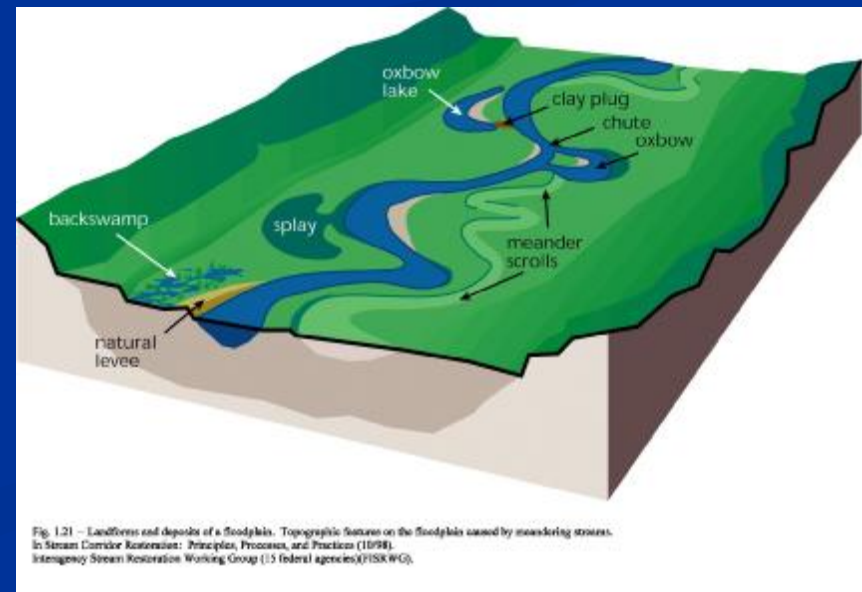
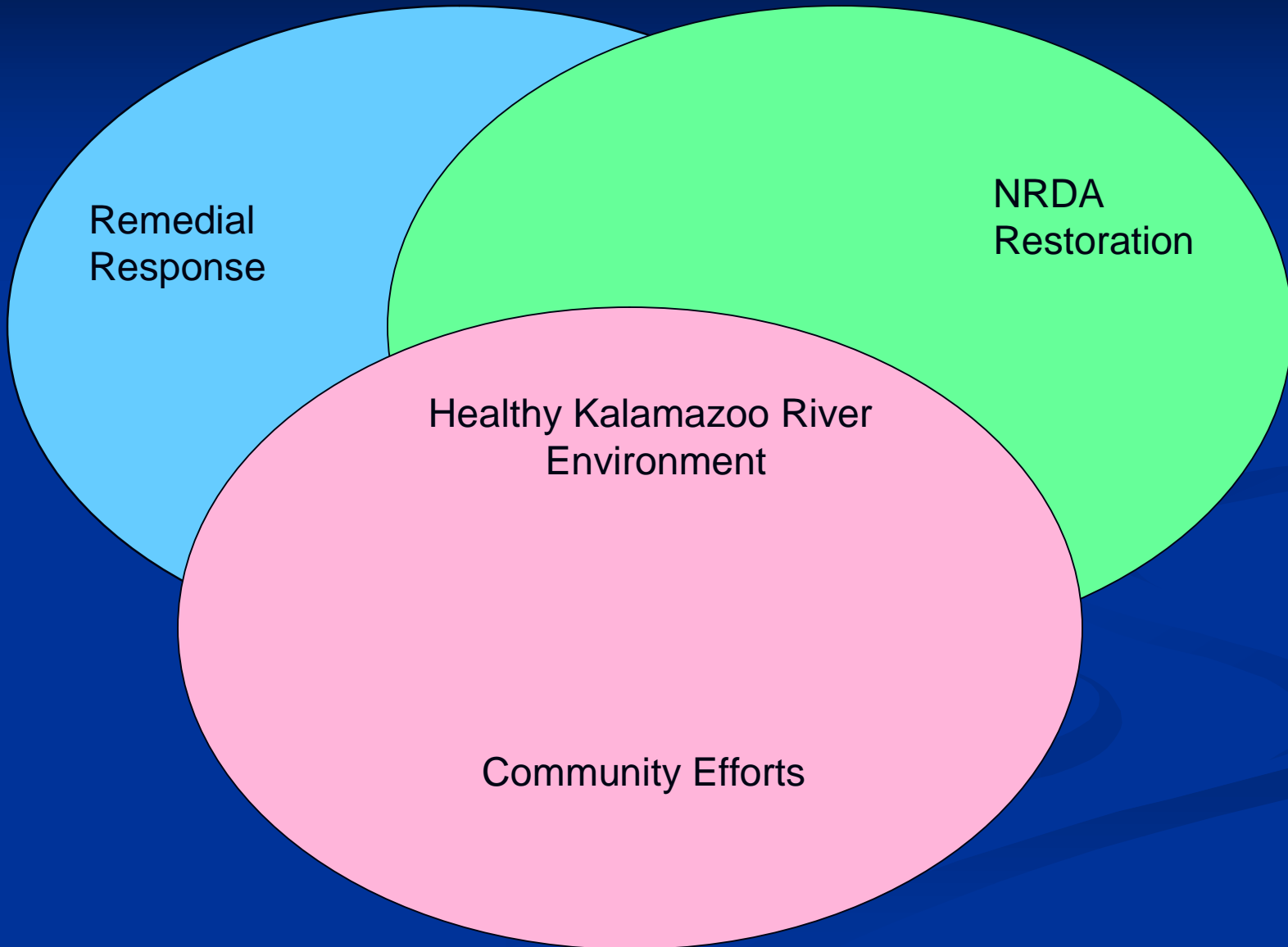


Fig. 1.21 -- Landforms and deposits of a floodplain. Topographic features on the floodplain caused by meandering streams. In Stream Corridor Restoration: Principles, Processes, and Practices (1998). Intergovernmental Stream Restoration Working Group (15 federal agencies) (ISRWG).

# Cooperative Efforts





# Next Steps

- n Future public meeting
- n Use results in mediated discussions
- n Based on remediation/restoration alternatives developed:
  - n Conduct focused studies to address remaining uncertainties, if relevant
  - n Analyze amount of restoration needed
    - n Baseline achievable? When?
    - n Compensatory

# Summary

- n Stage I of natural resource damage assessment completed.
- n Injuries documented to water, sediment, soil, benthos, fish, birds, mammals.
- n Restoration projects and criteria developed.
- n Some of compensatory damages calculated
- n Moving forward with integrating response, restoration and community efforts to improve the Kalamazoo River Environment

# More Information

## n Reports:

- n Local libraries: See fact sheet

- n CD here tonight

- n <http://midwest.fws.gov/nrda/kalamazoo>

## n Contacts:

- n Lisa Williams, USFWS: 517-351-8324 [lisa\\_williams@fws.gov](mailto:lisa_williams@fws.gov)

- n Nan Leemon, MDEQ: 517-373-4828 [leemonn@michigan.gov](mailto:leemonn@michigan.gov)

- n Todd Goeks, NOAA: 312-886-7527 [todd.goeks@noaa.gov](mailto:todd.goeks@noaa.gov)

## n Future public meetings



